Japanese Journal of Ichthyology
Vol. 35, No. 3 1988

魚類学雑誌
35巻3号 1988年

A New Gobiid Fish, *Fusigobius signipinnis*, from the Western Tropical Pacific

Douglass F. Hoese and Yasushi Obika

(Received November 30, 1984)

Abstract An undescribed goby has been collected from several localities in the western tropical Pacific, from Japan to Australia. This species is described as a new species, *Fusigobius signipinnis*. It differs from other species of *Fusigobius* in pectoral ray counts, colouration, largely separate pelvic fins, and shape of the first dorsal fin. The species is found in groups on sand, frequently flicking its first dorsal fin. Males are larger than females in mean size. Sex ratios are uneven, and females are twice as numerous as males.

Few species of the genus *Fusigobius* have been described. Koumans (1953) recognized two species, *F. neophytus* and *F. muscarum*. Examination of type material indicates that *Rhinogobius muscarum* Jordan et Seale is a species of *Pleurosicya*. Goren (1978), subsequently described the second species, *F. longispinus*, from the Red Sea. Hoese and Reader (1984) recently described the third species. In 1979 and 1980, the junior author obtained six specimens of another new species. The senior author had been examining the taxonomy of the genus and had access to large collections of *Fusigobius*, including the species described here. Consequently, we agreed to describe the new species jointly.

Hoese and Reader (1984) noted unusual sex ratios in *Fusigobius duospilus*. Males are generally much larger than females, but females are about twice as common as males. They suggested that these data were consistent with a sex change from female to male. Examination of material of the species described here indicates the same trend.

Materials and methods

All measurements were taken with dividers or dial calipers and recorded to the nearest 0.1 mm. Procedures of measurements and counts follow Hubbs and Lagler (1958), except as noted. The longitudinal scale count is taken from the upper pectoral origin to the base of the caudal fin, and the transverse count (TRB) from the anal origin upward and backward to the second dorsal fin. The number of pelvic ray branches is defined as the number of terminal tips on each pelvic ray. Nomenclature of the pores of the cephalic sensory system follows that of Prince Akihito and Meguro (1975). Observations of teeth, gill-rakers and branchiostegals were made on cleared and stained specimen (NSMT-P 18658). Morphometrics are based on measurements of 20 specimens selected at random. Fig. 1 was drawn from a specimen preserved in 75% ethyl alcohol (NSMT-P 18678).

Type material is deposited in the following institutions: Australian Museum, Sydney (AMS); Bernice P. Bishop Museum, Honolulu (BPBM); California Academy of Sciences (CAS); National Science Museum, Tokyo (NSMT); Queensland Museum, Brisbane (QM); National Museum of Natural History, Washington, D.C. (USNM).

Fusigobius signipinnis sp. nov.

(Japanese name: Hirefuri-sankaku-haze)
(Figs. 1–7)

Fusigobius sp. 4: Yoshino, 1984: 251, pl. 240-N, Ryukyu Is.

Holotype. AMS I. 20730-008, a 43.3 mm SL male, between Bird and South Islands, Lizard I., Queensland, Australia, H. and J. Larson, 3 February, 1977, 20–22 m.

Paratypes. JAPAN—NSMT-P 18678, 1 (33.7 mm SL) and NSMT-P 18679, 1 (26), Hirano (approximately 24°36′N, 124°20′E), Ishigaki I., Okinawa Pref., Japan, Y. Obika, 19 March, 1980; NSMT-P 18658–18660, 4 (19–24), same localty as NSMT-P 18678, T. Aoki and Y. Obika, 17 and 21 March, 1979. CAROLINE ISLANDS—BPBM 29382, 1 (22), Ponape, J. Randall and A. Emery, 3 April, 1970, 12 m; CAS 53242, 10 (28–34), Iwayama Bay, Palau, H. DeWitt and party, 3 October, 1957, 8–14 m; USNM 223210, 8 (18–36), Tanak I., Ponape, V. Springer, 11 September, 1980,

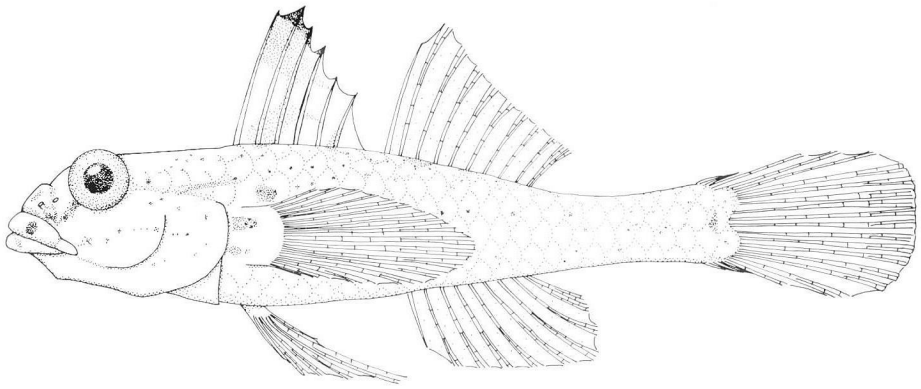


Fig. 1. *Fusigobius signipinnis* sp. nov., NSMT-P 18678, paratype, 33.7 mm SL, Ishigaki I., Japan.

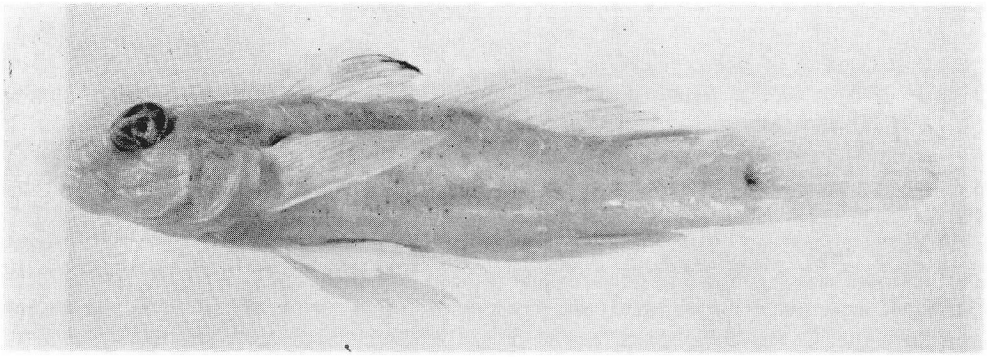


Fig. 2. Holotype of *Fusigobius signipinnis* sp. nov., AMS I. 20730-008, 43.3 mm SL, Lizard Island, Queensland, Australia.

0–7 m. PHILIPPINES—AMS I. 21907-21, 1 (29). Anilao, E. Murdy and C. Ferraris, 22 April, 1980, 15–21 m; AMS I. 21914-050, 3 (23–32), Caban I., D. Hoese, E. Murdy and C. Ferraris, 24 April, 1980, 9–25 m; AMS I. 21918-063, 2 (27–33), Caban I., D. Hoese, E. Murdy and C. Ferraris, 25 April, 1980, 11–29 m; AMS I. 21922-021, 3 (27–32), Anilao, D. Hoese, E. Murdy and C. Ferraris, 25 April, 1980, 18–21 m. NEW GUINEA—BPBM 29387, 3 (27–37), Kranket I., New Guinea, J. Randall, G. Allen and R. Steene, 13 August, 1973; USNM 244139, 6 (27–34), Jalun I., Hermit Islands, New Guinea, V. Springer, 1 November, 1981, 10–14 m; USNM 263430, 2 (29–32), Kranket I., New Guinea, B. B. Collette, 30 May, 1970, 2–8 m. GREAT BARRIER REEF, AUSTRALIA—AMS I. 18739-052, 21 (17–36), Lizard I. lagoon, Australian Museum party, 21 November, 1975, 3–10 m; AMS I. 19482-143, 1 (37), McGillivray Reef., Australian Museum party, 21 November, 1975, 3–25 m; AMS I. 20730-008, 6 (19–35), taken with holotype; AMS I. 22578-056, 1 (33), Escape Reef, Australian Museum party, 28 November, 1981, 6–10 m; AMS I. 22581-034, 22 (22–38), Escape Reef, Australian Museum party, 29 November, 1981, 10–14 m; ANSP 152967, 29 (15–42), Endeavour Reef, J. Tyler and C.L. Smith, 4 January, 1969, 8–18 m; QM I. 20735, 4 (20–36), Tijou Reef, Australian Museum Party, 22 February, 1979, 0–25 m.

Other material. INDONESIA—USNM 209848, 2 (31–35), Ceram; USNM 263342, 2 (29–31), Seribu, Java. GREAT BARRIER REEF, AUSTRALIA—AMS I. 17682-004, 1 (38), I. 20783-014, 3 (14–39) and I. 21529-016, 1 (39), Lizard Is.; AMS I. 20779-133, 2 (30–41) and I. 20956-032, 8 (22–39), Tijou Reef; AMS I. 22573-083, 3 (23–36), I. 22586-053, 4 (27–41), I. 22613-031, 3 (20–40), I. 22633-059, 13 (25–43), I. 22635-006, 1 (39) and I. 22637-032, 4 (29–36), Escape Reef.

Diagnosis. Second dorsal rays usually I, 9; anal rays usually I, 8; pectoral rays 16–19, usually 17–18; gill rakers on outer face of first gill arch usually 1+1+5–6; lower rakers on outer face of second arch usually 9; longitudinal scale count 21–25; transverse scale count (TRB) usually 7. Pectoral base and breast covered with large cycloid

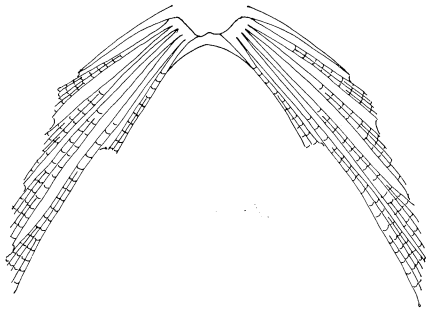


Fig. 3. Pelvic fins of *Fusigobius signipinnis* sp. nov., NSMT-P 18678, 33.7 mm SL, in ventral view.

scales. Margin of first dorsal fin broadly rounded, first spine usually longest, second spine subequal to first, sometimes slightly longer than first spine, other spines decreasing in length posteriorly; first dorsal spine 17–21% of SL; second dorsal spine 19–22% of SL; third dorsal spine 17–21% of SL; first dorsal fin just reaches to origin of second dorsal fin when depressed; depressed dorsal length 19–25% of SL; pelvic fins almost completely separate, a thin membrane uniting them basally only, no ventral frenum connecting pelvic spines (Fig. 3); pelvic rays modertely branched, fifth ray with usually with 2–3 branches, fourth ray with 4–6 branches in adults, 2–4 in juveniles; distal tip of first dorsal fin, with large black blotch covering tips of first four rays, blotch becoming diffuse ventrally; a distinct black spot above anterior margin of pectoral base; usually with an arched brown stripe from head extending over spot above pectoral base onto anterior part of body; caudal peduncle with a small vertically elongate black spot, sometimes becoming a vertical bar.

Description. Based on 64 specimens, 17–49 mm SL. Counts of holotype indicated with an asterisk. First dorsal VI (in 64)*; second dorsal I, 8 (2), I, 9 (61)*, I, 10 (1); anal I, 7 (2), I, 8 (62)*; pectoral rays 16 (1), 17 (46)*, 18 (16); segmented caudal rays 16 (1), 17 (39)*; branched caudal rays 6/6 (36)*, 6/7 (1), 7/6 (1), 7/7 (1); branchiostegal rays 5 (4); vertebrae 10+16 (4). Gill-rakers on outer face of first arch 1+1+5 (11), 1+1+6 (15), 1+1+7 (1); lower gill rakers on outer face of second gill-arch 7 (1), 8 (3), 9 (17), 10 (4); longitudinal scale series 21 (1), 22 (4), 23 (11)*, 24 (8), 25 (3); transverse scale series (TRB) 7 (23)*, 8 (1). Measurements of the holotype and paratypes from Japan are in Table 1.

Head more or less triangular in cross-section, head 30.5–34.5% of SL; snout short and pointed, 8–11% SL; mouth oblique, forming an angle of 20–25° with body axis; rear of jaws below front half of pupil; upper jaw length 10–12% SL; tongue

Table 1. Proportions expressed as percent of standard length in *Fusigobius signipinnis* sp. nov.

Measurement	Holotype	Paratypes					
	AMS I. 20730 -008	NSMT-P 18678	NSMT-P 18679	NSMT-P 18658	NSMT-P 18659	NSMT-P 18660-1	NSMT-P 18660-2
Total length	130.1	124.8	128.0	—	126.5	126.1	130.1
Standard length (mm)	43.3	33.7	25.9	19.0	22.6	24.0	19.6
Body depth at pelvic origin	23.6						
Body width behind pectoral origin	14.1						
Head length	31.2	32.8	33.3	34.5	31.5	31.7	32.4
Snout length	10.7	10.1	10.6	9.2	10.2	8.4	8.7
Eye diameter	10.7	11.7	13.0	14.5	13.3	13.4	15.3
Interorbital width	1.1	1.2	0.8	0.5	0.9	0.8	1.0
Caudal peduncle depth	13.0	10.4	11.2	10.5	10.6	10.4	9.7
Caudal peduncle length	29.3	29.9	32.7	34.7	29.3	31.1	31.4
Predorsal length	34.5	35.7	34.4	32.6	31.9	32.2	32.7
Caudal fin length	28.9	30.0	30.9	—	32.3	30.1	34.7
Pelvic fin length	32.1	32.1	35.0	40.0	36.8	32.2	35.0
Pectoral fin length	33.0	28.8	31.5	33.7	30.6	28.4	33.2
Second dorsal spine length	21.5	20.2	23.6	20.4	—	18.8	21.9
First dorsal soft ray length	19.0	19.3	22.4	20.5	—	—	—
Sixth anal soft ray length	16.3	17.2	19.7	18.4	19.5	16.3	18.9

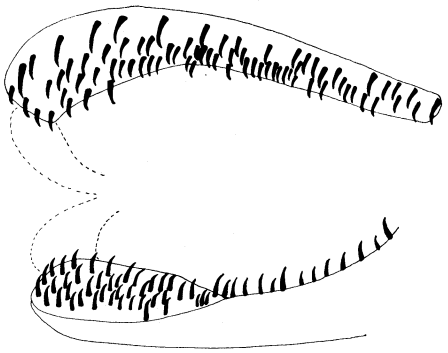
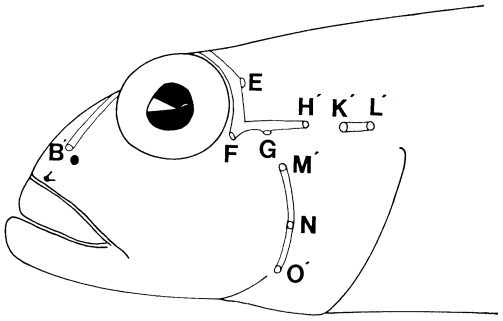


Fig. 4. Diagramatic drawing of the teeth of left side of upper and lower jaws of *Fusigobius signipinnis* sp. nov., NSMT-P 18658.



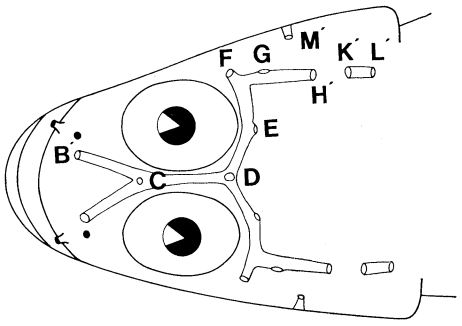


Fig. 5. Cephalic sensory canal system of holotype of *Fusigobius signipinnis* sp. nov., AMS I. 20730-008, 43.3 mm SL. Letters indicate head open pores. A prime mark (′) indicates a pore at end of canal. As for abbreviations, see the text.

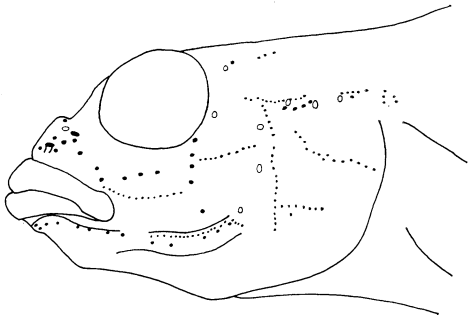


Fig. 6. Pit organs of *Fusigobius signipinnis* sp. nov., NSMT-P 18678, 33.7 mm SL, expressed as solid dots. Open circles are pores of cephalic sensory system. Specimen is atypical in lacking lateral canal pore above preoperculum.

tip rounded, with tip free from floor of mouth; teeth conical, long and curved inwardly at tip;teeth on lower jaw arranged in several rows at anterior half and tapering to one row posteriorly; teeth on upper jaw in several rows at anterior quarter and tapering to two rows posteriroly; teeth of outer rows of both jaws slightly enlarged (Fig. 4); anterior nostril a short tube, just behind upper lip; posterior nostril a pore closer to anterior nostril than to eye; eye 8–15% SL, with relative size decreasing with increasing size of fish; dorsal edge of eye little above dorsal profile of head; interorbital space very narrow and concave. Body slender and compressed, tapering posteriorly; body depth at pelvic origin 20–22% SL; body depth at anal origin 19–21% SL. Origin of first dorsal fin above pectoral fin base; first and second dorsal fins separated by a very short distance; first segmented ray longest in second dorsal fin; sixth segmented ray longest in anal fin; pectoral fin long, extending to above middle of anal fin base, 29–35% SL; pelvic fin 32–40% SL; caudal fin with a slightly rounded margin, 27–35% SL. Body covered with ctenoid scales; breast and pectoral base scales cycloid; midline of nape naked; sides of nape scaled to above operculum; cheek and operculum without scales. Head pores (Fig. 5)—a posterior nasal pore adjacent to each posterior nostril (B′), a median anterior interorbital pore (C), a median posterior interorbital pore (D), a postorbital pore behind each eye (E), an infraorbital pore below each postorbital pore (F), a lateral canal pore above preoperculum (G), a terminal lateral canal pore above posterior preopercular margin (H′), a short tube with pores at each end above operculum (K′ and L′), and 3 preopercular pores (M′, N, O′). Cheek papillae (Fig. 6) referred to here as a reduced transverse pattern (after Hoese, 1983)—a horizontal papilla line extending posteriorly from posterior end of

upper jaw, with papillae axes at right angles to papilla line, a more or less horizontal line above this line, with 3 to 5 papillae, with axes along the line, a vertical line below posterior margin of eye, with papillae axes at right angles to line, a horizontal line with papillae axes at right angles to line behind vertical line dorsally on preoperculum; other papillae shown in Fig. 6. Because of the reduced nature of the papillae, no attempt is made here to number the lines.

Colouration of fresh material from Japan, the Philippines and Australia: Head and body translucent in life, fading to an opaque white after death; head and body covered with minute brown or reddish brown spots, sometimes surrounded by a narrow yellow ring; usually with a few scattered small white spots ventrally on head and body; a narrow oblique dark brown stripe from anteroventral margin of eye extending to and crossing lips near middle of jaws; a series of round or elongate brown spots extending from end of jaw obliquely upward across preoperculum; a broken brown to black stripe extending from above operculum, arching above pectoral base; a rounded brown or black spot, slightly smaller than pupil diameter, above and slightly behind pectoral base; pectoral base with a brown horizontal stripe dorsally, with a silver or white horizontal stripe below and usually a pale brown broken horizontal stripe ventrally; posterior end of caudal peduncle with a small vertically elongate brown or black oval spot or bar. Fins, except for pectoral fin, often densely covered with minute white spots; first dorsal fin with black at distal tip, grading ventrally into large orange, reddish brown, or brown blotch, with a thin ventral extension between second and third dorsal spines; first dorsal fin sometimes with a faint grey, more or less horizontal stripe near base of fin; second dorsal fin often with two or rarely three thin, brown horizontal stripes on lower half of fin; anal fin sometimes with two narrow horizontal brown stripes near base; other fins hyaline.

Colouration of preserved material: Similar to fresh colour, except dark spots and stripes become brown or black; white and reddish brown and orange disappearing; first dorsal marking brown to black.

Similarity to other species. *Fusigobius signipinnis* differs from *F. neophytus* (Günther), *F. duospilus* Hoese et Reader, and *F. longispinus* Goren in having separate pelvic fins. *Fusigobius longispinus* differs from other species in having a higher first dorsal fin. *Fusigobius neophytus* differs from other species of the genus in having an extra head pore immediately behind the infraorbital pore behind the eye. *Fusigobius duospilus* differs from other species of *Fusigobius* in having two large round spots on the first dorsal fin.

Variation. Little geographical variation was noted, although the brown and black spots and stripes on the body are larger and darker in Philippine material. Seven of the nine Philippine specimens have 18 pectoral rays, while nine of 55 specimens from other localities have 18 pectoral rays.

The number of pelvic ray branches increases significantly with increasing size ($p<0.001$). For the fourth pelvic ray, two branches occur only in specimens smaller than 21 mm SL; three branches in specimens 22–32 mm SL; four branches in specimens 26–34 mm SL; five branches in specimens 30–38 mm SL; and six branches in specimens 36–40 mm SL. No apparent size trends were noted in the branching of the fifth pelvic ray, although most Australian specimens have two branches and specimens from other localities often have three branches.

Males have a very elongate urogenital papilla, while females have a short rounded papilla. No other morphological differences were found between males and females. However, sex ratios differed significantly from a one to one ratio. In both Australian and other material, there were

Table 2. Sex ratio and size of males and females in *Fusigobius signipinnis* sp. nov. Sizes are standard lengths in mm.

Sex	Australia				Other Localities			
	N	Mean Size	Variance	Size Range	N	Mean Size	Variance	Size Range
Males	28	37.4	21.0	24–42	15	32.4	10.3	29–40
Females	55	30.0	17.5	20–38	26	28.7	11.2	22–35

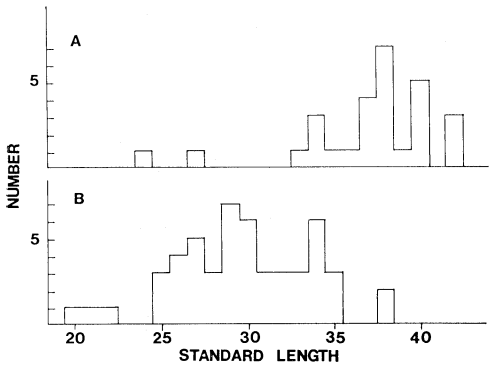


Fig. 7. Size (mm SL) frequency distributions in *Fusigobius signipinnis* sp. nov., from Australia. A, males; B, females.

significantly more females than males, with the female/male ratios of 1.9 for Australian material and 1.7 for other localities. Males also averaged a significantly larger size than females ($p<0.001$ for Australia and $p=0.05$ for other localities), although there is considerable overlap in the size of the two sexes (Table 2, Fig. 7). Experience has shown that field workers often collect larger individuals in preference to smaller individuals. Consequently the observed proportion of males may be artifically high. The combination of the larger size and fewer numbers of males suggests that some individuals of this species may change sex from female to male. Of 44 males examined, only two were smaller than 28 mm. Studies of other gobioid species by the senior author have indicated that males often average a large size than females, but sex ratios are typically about equal.

Distribution. *Fusigobius signipinnis* is known from Japan, the Caroline Islands, the Philippines, Indonesia, New Guinea, and Australia.

Ecology. This species appears to be an exclusively coral reef species, that lives on sand in depths from 5–25 m, often in areas protected by caves and crevices. They are commonly seen in small sand patches on steep dropoffs. In some areas the species was observed in large groups of up to 30 individuals. The species is characteristic in flicking the first dorsal fin up and down, resulting in a flashing of the black spot. The behaviour was observed in both small and large groups.

Etymology. Derived from the Latin, *signum* (flag or sign)+*pinna* (fin), alluding to the characteristic waving of the first dorsal fin, exposing the black spot.

Acknowledgments

We thank Dr. E. A. Lachner and Ms. S. Jewett of the Smithsonian Institution for providing us with unpublished information. Material for this study was provided by Drs. T. Iwamoto, S. Poss, J. Randall, and V. Springer. Heartfelt thanks are due to the following persons for critical reading of the manuscript: the late Dr. Fujio Yasuda, Mr. Akihiko Yatsu of the Japan Marine Fishery Resource Research Center, and Drs. Ryoichi Arai and Keiichi Matsuura of the Department of Zoology, National Science Museum, Tokyo. Cooperation in collecting material was made with the kindness of Mr. Tomofumi Aoki and other members of the Association for Studying of Aquatic Organisms (Suisan Seibutsu Kenkyu Kai) of the Tokyo University of Fisheries, W. A. Starck, II, and staff of the Australian Museum and Australian Institute of Marine Sciences.

Literature cited

Akihito, Prince and K. Meguro. 1975. Description of a new gobiid fish, *Glossogobius aureus*, with notes on related species of the genus. Japan. J. Ichthyol., 22(3): 127–142.

Goren, M. 1978. A new gobiid genus and seven new species from the Sinai coasts (Pisces: Gobiidae). Senckenb. Biol., 59(3/4): 191–203.

Hoese, D. F. 1983. Sensory papilla patterns of the cheek lateralis system in the gobiid fishes *Acentrogobius* and *Glossogobius*, and their significance for the classification of gobioid fishes. Rec. Austr. Mus., 35: 192–222.

Hoese, D. F. and S. Reader. 1984. A new gobiid fish, *Fusigobius duospilus*, from the tropical Indo-Pacific. J.L.B. Smith Inst. Ichthyol., Spec. Publ., (36): 1–9.

Hubbs, C. L. and K. F. Lagler. 1958. Fishes of the Great Lakes region. Bull. Cranbrook Inst. Sci., (26), xi+213 pp., 44 pls.

Koumans, F. P. 1953. Fishes of the Indo-Australian Archipelago, Vol. 10. Gobioidea. E. J. Brill, Leiden, 423 pp.

Yoshino, T. 1984. *Fusigobius* Sp. 4. Page 251. pl. 240 *in* H. Masuda, K. Amaoka, C. Araga, T. Uyeno and T. Yoshino, eds. The fishes of the Japanese Arcipelago. English text and plates. Tokai Univ. Press, Tokyo.

(DFH: Australian Museum, P.O. Box A285, Sydney, N.S.W., 2000, Australia; YO: Kyowa Junior High School, Kyowa 1-3-10, Sagamihara 229, Japan)

西部太平洋熱帯域より採集されたハゼ科サンカクハゼ属魚類の1新種

Douglass F. Hoese・小比賀　康

日本からオーストラリアの西部太平洋熱帯域の数地点から得られた，ハゼ科サンカクハゼ属魚類の1新種 *Fusigobius signipinnis*（和名：ヒレフリサンカクハゼ）を記載した．本種は，胸鰭条数，体色，大きく離れた左右の腹鰭及び背鰭の形態で他のサンカクハゼ属魚類と区別される．本種の雄は一般に雌より大きく，性比は雌雄2:1である．

(Hoese：オーストラリア　オーストラリア博物館；小比賀：229 相模原市共和 1-3-10 共和中学校)